

WHAT IS CLAIMED IS

- 5
1. A circuit substrate comprising:
a passive element; and
an interconnection pattern,
wherein any of said passive element and
10 interconnection pattern is formed by an aerosol
deposition process that uses aerosol of a fine
particle material.
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2. The circuit substrate as claimed in claim
1, wherein said passive element includes at least one
of a dielectric film, a resistance film and a
20 conductor film formed by an aerosol deposition process.
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3. The circuit substrate as claimed in claim
1, wherein said circuit substrate comprises a base
substrate and an insulation layer laminated on the
base substrate,
wherein at least one of the base substrate
30 and the insulation layer comprises a resin material.
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4. The circuit substrate as claimed in claim
3, wherein said resin material comprises at least one
of an epoxy resin, a polyimide resin, a polyester

resin, a fluorocarbon copolymer and a fiber glass.

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5. The circuit substrate as claimed in claim 2, wherein said dielectric film and said resistance film comprises an oxide ceramic.

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6. The circuit substrate as claimed in claim 5, wherein said dielectric film and said resistance film comprises an oxide ceramic having a perovskite structure.

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7. The circuit substrate as claimed in claim 4, wherein said conductor film includes at least one of Ag, Au, Pt, Pd, Cu and Al.

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8. The circuit substrate as claimed in claim 1, wherein said fine particle material used in said aerosol deposition process is added with or coated with an aluminum compound or a lead compound.

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9. The circuit substrate as claimed in claim 1, wherein said fine particle material comprises fine

particles having an average diameter in the range of
the 10nm - 1 μ m

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10. An electron device, comprising:
a circuit substrate including a passive
element and an interconnection pattern; and
10 an electronic component provided on said
circuit substrate,

wherein any of said passive element and
interconnection pattern is formed by an aerosol
deposition process that uses aerosol of a fine
15 particle material.

20 11. A circuit substrate, comprising:
a base substrate;
an insulation layer formed on said base
substrate; and
a capacitor, said capacitor comprising a
25 first electrode layer formed selectively on said
insulation layer, a dielectric film at least covering
said first electrode layer, and a second electrode
layer formed on said dielectric film so as to oppose
said first electrode layer,

30 wherein at least one of said base substrate
and insulation layer comprises a resin material, and
wherein said dielectric layer is formed by
an aerosol deposition process that uses aerosol of a
fine particle material.

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12. An electron device, comprising:
a circuit substrate; and
an electronic component provided on said
circuit substrate, said circuit substrate comprising:

5 a base substrate;

an insulation layer formed on said base
substrate; and

a capacitor, said capacitor comprising a
first electrode formed selectively on said insulation
10 layer, a dielectric film covering at least said first
electrode layer, and a second electrode formed on said
dielectric film so as to oppose said first electrode
layer,

wherein at least one of said base substrate
15 and insulation layer comprises a resin material, and

wherein said dielectric film is formed by an
aerosol deposition process that uses aerosol of a fine
particle material.

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13. A method of fabricating a circuit
substrate, said circuit substrate having any of a
25 passive element and an interconnection pattern, said
passive element comprising at least one of a
dielectric film, a resistance film and a conductor
film, said method comprising a film forming step,

said film forming step forming at least one
30 of said dielectric film, said resistance film and said
conductor film by ejecting aerosol of a fine particle
material together with a carrier gas.

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14. The method as claimed in claim 13,

wherein said circuit substrate includes a base substrate and an insulation layer laminated on said base substrate,

at least one of said base substrate and said
5 insulation layer comprises a resin material.

10 15. The method as claimed in claim 13,
wherein said aerosol is ejected with a velocity in the
range of 3 - 400 m/second.

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16. The method as claimed in claim 13,
wherein said carrier gas comprises at least one of a
helium gas, a neon gas, an argon gas and a nitrogen
20 gas.

25 17. The method as claimed in claim 13,
wherein said fine particle material comprises fine
particles having an average diameter of 10nm - 1 μ m.

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18. The method as claimed in claim 13,
wherein said resin material comprises at least one of
an epoxy resin, a polyimide resin, a polyester resin,
35 a fluorocarbon copolymer, and a fiber glass.

19. The method as claimed in claim 13,
further comprising a planarizing step for planarizing
a surface of any of said dielectric film, resistance
film and conductor film after said film forming step.

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20. A structure including a film-like body
formed by spraying aerosol of a fine particle material
10 on a substrate by an aerosol deposition process,
wherein said film-forming body contains a
binder.

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21. The structure as claimed in claim 20,
wherein said binder is any of an aluminum compound or
lead compound.

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22. The structural body as claimed in claim
25 21, wherein said aluminum compound is any of aluminum
oxide, aluminum hydroxide, or aluminum alkoxide.

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23. The structure as claimed in claim 21,
wherein said lead compound has a perovskite structure.

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24. The structure as claimed in claim 20,

wherein said fine particle material is any of an oxide, a nitride, a carbide, or a boride.

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25. The structure as claimed in claim 24, wherein said oxide is an oxide ceramic having a perovskite structure

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26. The structure as claimed in claim 20, wherein said fine particle material is formed of a metal.

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27. The structure as claimed in claim 20, wherein said film-like body has a thickness in the range of $5\mu\text{m}$ - 1mm.

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28. The structure as claimed in claim 20, wherein said substrate is formed of a resin material, and wherein said resin material is selected from any of the group consisted of an epoxy resin, a polyimide resin, a polyester resin, a fluorocarbon copolymer and a fiber glass.

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29. A method of forming a structure having a film-like body by an aerosol deposition process, comprising the step of spraying a fine particle material and a binder to a substrate.

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30. The method as claimed in claim 29,
10 wherein said binder is an aluminum compound or a lead compound.

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31. The method as claimed in claim 29,
wherein said binder covers a surface of said fine particle material.

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32. The method as claimed in claim 29,
wherein said binder is formed of an aluminum alkoxide
25 having a general formula represented as $\text{Al}(\text{OR})_3$ (R is an alkyl group), and further comprises a surface treatment process of said fine particle material by using aluminum alkoxide having a general formula represented as $\text{Al}(\text{OR})_3$ (R is an alkyl group) before
30 said spraying step.

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33. The method as claimed in claim 32,
further comprising, after said surface treatment process, the step of baking and converting said

aluminum alkoxide into an aluminum oxide film.

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34. The method as claimed in claim 29,
wherein said binder is an aluminum oxide film, and
wherein said aluminum oxide film is formed on the
surface of said fine particle material by using a CVD
10 process before said spraying process.

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35. The method as claimed in claim 29,
wherein said binder is a particulate material and
wherein there is provided a step of mixing said fine
particle material and said binder.

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36. The method as claimed in claim 29,
wherein said binder is a particulate material and
25 wherein said fine particle material and said binder
are sprayed from respective, different nozzles in said
spraying process.

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37. The method as claimed in claim 29,
wherein said fine particle material and said binder
are used with a ratio (fine particle material: binder)
35 of 99.9:0.1 - 50:50 in terms of mass.

38. A circuit substrate comprising an interlayer insulation film and a conductor laminated thereon,

said interlayer insulation film being
5 deposited by spraying a fine particle material in the form of aerosol,

said conductor layer forming a continuous film of a metal or an alloy.

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39. The circuit substrate as claimed in claim 38, wherein said fine particle material
15 comprises a ceramic including at least one of Al_2O_3 , MgO , SiO_2 , CaO , TiO_2 , $3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$, $\text{MgO} \cdot \text{Al}_2\text{O}_3$, $2\text{MgO} \cdot \text{SiO}_2$, $2\text{Al}_2\text{O}_3 \cdot 2\text{MgO}$, 5SiO_2 , $\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$, BaTiO_3 , BaSrTiO_3 , BaTiZrO_3 , BaTi_4O_9 , $\text{Ba}_2\text{Ti}_9\text{O}_{20}$, $\text{Ba}(\text{Mg}_{1/3}\text{Ta}_{2/3})\text{O}_3$, $\text{Ba}(\text{Zn}_{1/3}\text{Ta}_{2/3})\text{O}_3$, $\text{Ba}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3$, ZrSnTiO_4 , PbZrTiO_3 ,
20 $\text{Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$, $\text{Pb}(\text{Ni}_{1/3}\text{Nb}_{2/3})\text{O}_3$ and AlN .

40. A circuit substrate as claimed in claim 38, further comprising a filter, said filter comprising said interlayer insulation film and a conductor layer patterned on said interlayer insulation film.

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41. The circuit substrate as claimed in claim 38, further comprising a capacitor provided in or on said circuit substrate, said capacitor comprising plural electrode layer and a dielectric

layer formed between said electrode layers,
said dielectric layer being deposited by
spraying aerosol of another fine particle material by
an aerosol deposition process.

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42. The circuit substrate as claimed in
10 claim 41, wherein said another fine particle material
is a ceramic including at least one of TiO_2 , BaTiO_3 ,
 BaSrTiO_3 , BaTiZrO_3 , BaTi_4O_9 , $\text{Ba}_2\text{Ti}_9\text{O}_{20}$, $\text{Ba}(\text{Mg}_{1/3}\text{Ta}_{2/3})\text{O}_3$,
 $\text{Ba}(\text{Zn}_{1/3}\text{Ta}_{2/3})\text{O}_3$, $\text{Ba}((\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3$, ZrSnTiO_4 , PbZrTiO_3 , Pb
 $(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$ and $\text{Pb}(\text{Ni}_{1/3}\text{Nb}_{2/3})\text{O}_3$.

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43. The circuit substrate as claimed in claim 38,
20 wherein any of said conductor layer and electrode
layer contains one of Cu, Ag, Au and Al.

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44. A passive component, comprising
lamination of a dielectric layer and a conductor layer,
said dielectric layer being formed by
spraying aerosol of fine particle material,
30 said conductor layer comprising a continuous
film of a metal or an alloy,
said fine particle material comprising at
least one of Al_2O_3 , MgO , SiO_2 , CaO , TiO_2 , $3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$,
 $\text{MgO} \cdot \text{Al}_2\text{O}_3$, $2\text{MgO} \cdot \text{SiO}_2$, $2\text{Al}_2\text{O}_3 \cdot 2\text{MgO} \cdot 5\text{SiO}_2$, $\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot$
35 2SiO_2 , BaTiO_3 , BaSrTiO_3 , BaTiZrO_3 , BaTi_4O_9 , $\text{Ba}_2\text{Ti}_9\text{O}_{20}$,
 $\text{Ba}(\text{Mg}_{1/3}\text{Ta}_{2/3})\text{O}_3$, $\text{Ba}(\text{Zn}_{1/3}\text{Ta}_{2/3})\text{O}_3$, $\text{Ba}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3$,
 ZrSnTiO_4 , PbZrTiO_3 , $\text{Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$, $\text{Pb}(\text{Ni}_{1/3}\text{Nb}_{2/3})\text{O}_3$ and

AlN.

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45. An electron device comprising:

a circuit substrate in which an interlayer insulation film and a conductor layer are laminated; and

10 an electronic component provided on said circuit substrate,

said interlayer insulation film being deposited the by spraying aerosol of a fine particle material,

15 said conductor layer forming a continuous film of a metal or alloy.

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46. An electron device comprising a substrate and a passive component provided on said substrate, said passive component comprising lamination of a dielectric layer and a conductor layer,

25 said dielectric layer being formed by spraying aerosol of a fine particle material,

said conductor layer forming a continuous film of metal or alloy,

30 said fine particle material including at least one of Al_2O_3 , MgO , SiO_2 , CaO , TiO_2 , $3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$, $\text{MgO} \cdot \text{Al}_2\text{O}_3$, $2\text{MgO} \cdot \text{SiO}_2$, $2\text{Al}_2\text{O}_3 \cdot 2\text{MgO} \cdot 5\text{SiO}_2$, $\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$, BaTiO_3 , BaSrTiO_3 , BaTiZrO_3 , BaTi_4O_9 , $\text{Ba}_2\text{Ti}_9\text{O}_{20}$, $\text{Ba}(\text{Mg}_{1/3}\text{Ta}_{2/3})\text{O}_3$, $\text{Ba}(\text{Zn}_{1/3}\text{Ta}_{2/3})\text{O}_3$, $\text{Ba}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3$, ZrSnTiO_4 , PbZrTiO_3 , $\text{Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$, $\text{Pb}(\text{Ni}_{1/3}\text{Nb}_{2/3})\text{O}_3$ and AlN.

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47. A fabrication method of a circuit substrate in which an interlayer insulation film and a conductor layer are laminated, comprising the steps of:

5 forming said interlayer insulation film by spraying aerosol of a fine particle material together with a carrier gas; and

 forming said conductor layer while depositing a metal or an alloy thereon.

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48. The method as claimed in claim 47,
15 wherein said step of forming said conductor layer is conducted by using any of a non-electrolytic plating process, an electrolytic plating process, a sputtering process, a vacuum evaporation deposition process and a CVD process

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49. The method as claimed in claim 47,
25 further comprising the step of forming an connection hole in said interlayer insulation film by using a hydrofluoric acid while masking said interlayer insulation film.